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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of
Ji-Yong PARK, et al.

Docket No. 6161.0111.US

Serial No.: 10/779,781

Group Art Unit: 2811

Filed: Herein

Examiner: Unassigned

For: **FLAT PANEL DISPLAY DEVICE WITH POLYCHRYSTALLINE SILICON THIN FILM TRANSISTOR**

Commissioner for Patents and Trademarks
Washington, D.C. 20231

PETITION FOR ACCELERATED EXAMINATION UNDER 37 C.F.R. 1.102(d)

Sir:

Applicant herein respectfully petitions under 37 CFR §1.102(d) and in accordance with MPEP §708.02 VIII for the accelerated examination of the above-identified application. Applicant attaches a check in the amount of $130.00 as set forth in 37 CFR §1.17(i).

MPEP §708.02 VIII

Applicants are of the opinion that all claims are directed to a single invention. Nevertheless several embodiments of the present invention are disclosed within the application. If required, Applicants request that the Examiner contact the undersigned for a telephonic election or restriction in accordance with restriction practice to expedite any such issues that may arise.

A pre-examination search was conducted in the U.S. Patent Office. This search included the following classes/subclasses:

Class 257/subclasses 57, 59, 72, 223, 227, 288, 291, 292, 433, 439 and 655

Class 438/subclass 149

The disclosed references deemed most closely related to the subject matter encompassed by the claims of the above application are discussed below. Attached is an Information Disclosure Statement and PTO Form 1449 prepared in accordance with 37 CFR §1.197 and 1.98 and filed concurrently herewith. The following is a detailed discussion of the references deemed most closely related to the claimed subject matter of the above-identified application, and distinguishing features according to the opinion of the Applicant.

U.S. Pat. No. 5,744,824 to Kousai, *et al.*

A liquid crystal display includes a semiconductor device with two types of thin film trasnsistors. The two types of thin film transistors have two different property types. One silicon layer is formed and is suitable for a thin film transistor with a relatively large "off" current and a high mobility. Another silicon layer is formed and is suitable for a thin film transistor with a relatively low "off" current and a low mobility.

Applicants respectfully asserts that this patent does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this patent does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. No. 5,932,893 to Miyanaga

Thin film transistors used in picture elements may be different types than the thin film transistors used in the driver circuits. The thin film transistors used in the picture element has low degree of mobility and a low off-state current. The thin film transistors used on the driver circuits has a high degree of mobility and thus a high off-state current.

Applicant respectfully asserts that this patent does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this patent does not address differing numbers of grain boundaries in the thin film transistors.

Further, this patent does not qualify as prior art under 35 U.S.C. §103(c), as the assignee of this patent is also the assignee of the present application.

U.S. Pat. No. 6,177,301 to Jung

Thin fim transistors are fabricated for liquid crystal displays having a drive circuit and a pixel array, where the physical characteristics of the thin film transistors are uniform. A polycrystaline silicon layer is formed by growing silicon grains in a first direction using a sequential lateral solidification. The active channel of the thin film transistor is oriented at an angle with respect to the first direction. The gate, source and drain electrodes of the thin film transistor are then formed.

Applicants respectfully asserts that this patent does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this patent does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. No. 6,479,837 to Ogawa, *et al.*

A thin film transistor is formed on a polycrystalline silicon thin film. The crystal grains of the polycrystalline silicon thin films are amsotropically grown at an angle reative to the gate length direction of the thin film transistor.

Applicants respectfully asserts that this patent does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the

active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this patent does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. No. 6,506,669 to Kuramasu, *et al.*

Thin film transistors used in driving circuits for liquid crystal display devices includes a polycrystalline semiconductor thin film. Surfaces on the semiconductor thin film are planarized. Surface portions in which tramp materials are segregated are removed. The resulting thin film transistor has higher mobility and high reliability.

Applicants respectfully asserts that this patent does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this patent does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. No. 6,521,473 to Jung

Silicon film crystalized by sequential lateral solidification is used in liquid crystal displays. Silicon grains are grown on a slant with respect to the substrate of which the film is formed. The process results in uniform grain boundaries in channel regions of respective thin film transistors, thereby providing uniform electrical characteristics of the thin film transistors in both the driver and pixel portions of a liquid crystal display panel.

Applicants respectfully asserts that this patent does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this patent does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. No. 6,605,497 to Yamakazi, *et al.*

A crystalline semiconductor thin film is formed using a catalytic element and is subject to a heat treatment in an atmosphere including halogen at a temperature exceeding 700 degrees C. The resulting crystal structure has substantially no crystal grain boundaries.

Applicants respectfully asserts that this patent does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this patent does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. No. 6,692,996 to Lee

An amorphous single-crystallized layer is obtained by filtering a single crystal component from the poly-crystal region being crystallized by metal induced lateral crystallization (MILC). The single component continues to grow in the amorphous silicon region beyon dthe crystal filtering layer. The resulting silicon layer may then be fabricated into a thin film transistor which has improved electrical characteristics, including electron mobility and leakage current.

Applicants respectfully asserts that this patent does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this patent does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. No. 6,727,522 to Kawasaki, *et al.*

A transistor uses a transparent channel layer made of a transparent insulative material, such as zinc oxide or the like.

Applicants respectfully asserts that this patent does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the

active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this patent does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. No. 6,741,621 to Asano

A laser irradiation apparatus is used for crystallizing a semiconductor thin film.

Applicants respectfully asserts that this patent does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this patent does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. No. 6,759,679 to Lee

A uniformity in boundary grains in poly-silicon layers of thin film transistors is achived using a silicon crystallization process. Parameters are set to create thin film transistors that have uniform characteristics.

Applicants respectfully asserts that this patent does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this patent does not address differing numbers of grain boundaries in the thin film transistors.

Further, this patent does not qualify as prior art under 35 U.S.C. §103(c), as the assignee of this patent is also the assignee of the present application.

U.S. Pat. No. 6,781,162 to Yamakazi *et al.*

An a active matrix light emitting device has a light emitting structure. The electrode on the thin film transistor side electrically connected to the thin film transistor on the substrate is a formed as a cathode. An organic compound is formed on the cathode electrode. An anode is then formed as a transparent electrode.

Applicants respectfully asserts that this patent does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this patent does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. Pub. No. 2003/0068836 to Hongo, *et al.*

A liquid crystal display device includes a polycrystalline silicon film having substantially the same properties as a single crystal. A laser beam radiated on the amorphous silicon is pulsed using an EO modulator and has an arbitrary temporal energy change when pulsing. Further, the laser beam has an arbitrary spatial energy distribution and eliminates coherency using a high-speed rotating diffuser.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. Pub. No. 2003/0089907 to Yamaguchi, *et al.*

A thin film of silicon is scanned twice with a laser beam to in two lateral directions in which the crystal grains grow larger to form polycrystals in exact positions of the thin film.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. Pub. No. 2003/0102508 to Lee

A uniformity in boundary grains in poly-silicon layers of thin film transistors is achived using a silicon crystallization process. Parameters are set to create thin film transistors that have uniform characteristics.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

Further, this publication does not qualify as prior art under 35 U.S.C. §103(c), as the assignee of this patent is also the assignee of the present application.

U.S. Pat. Pub. No. 2003/0193069 to Park, *et al.*

A uniformity in boundary grains in poly-silicon layers of thin film transistors is achived by adjusting the position of primary crystal grain boundaries.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

Further, this publication does not qualify as prior art under 35 U.S.C. §103(c), as the assignee of this patent is also the assignee of the present application.

U.S. Pat. Pub. No. 2003/0235971 to Yamakazi, *et al.*

The position of crystal grains is controlled in an arrangement in a thin film transistor. Crystals having a large grain size are continuously formed through super lateral growth. Laser irradiation occurs on a marked portion of the semiconductor film so that at least a minimum portion is crystallized.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. Pub. No. 2004/0004219 to Lee, *et al.*

A uniformity in boundary grains in poly-silicon layers of thin film transistors is achived using a silicon crystallization process. Non-uniformity of thin film transistor characteristics due to misalignment or displacement are eliminated.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

Further, this publication does not qualify as prior art under 35 U.S.C. §103(c), as the assignee of this patent is also the assignee of the present application.

U.S. Pat. Pub. No. 2004/0040938 to Yamakazi, *et al.*

A laser crystallization method suppresses thermal damage on the substrate while enhancing substrate processing efficiency. The crystallinity of the semiconductor substrate is increased.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. Pub. No. 2004/0132266 to Yamakazi, *et al.*

A laser continuously oscillates to enhance efficiency of substrate processing. A thin film transistor manufactured using the semiconductor film has fewer crystal grain boundries, as a large size crystal grain is formed in the semiconductor film. The resulting mobility in n-channel thin film transistors is different than the resulting mobility in p-channel thin film transistors.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. Pub. No. 2004/0144988 to Jung, *et al.*

An active matrix display device includes a plurality of pixels, with each pixel having at least one thin film transistor. The polycrystalline layer in the device has grain boundaries of substantially identical numbers, substantially identical directions, and occurring at substantially regular intervals.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants'

interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. Pub. No. 2004/0164300 to Yamakazi, *et al.*

A thin film transistor is formed using a crystalline silicon film. A crystal structure body has rod-like or flattened rod-like crystals which grow in a direction parallel to each other.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

U.S. Pat. Pub. No. 2004/077132 to Lee, *et al.*

A uniformity in boundary grains in poly-silicon layers of thin film transistors is achived using a silicon crystallization process. Parameters are set to create thin film transistors that have uniform characteristics. The number of crystal grain boundaries in the active channel regions may be sychronized.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

Further, this publication does not qualify as prior art under 35 U.S.C. §103(c), as the assignee of this patent is also the assignee of the present application.

KR2003-0059593

Crystal grains form semiconductor patterns in a polycrystalline silicon thin film. The gate electrode has an area parallel to the crystal grains and areas vertical to the growth direction of the crystal grains.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

KR2003-0046101

A semiconductor layer has a grain with a growing direction. The thin film transistor has uniformity of mobility of current by forming the gate electrode at an angle to the growing direction of the grain.

Applicants respectfully asserts that this publication does not disclose or suggest, in combination, at least a thin film transistor at the driving circuit region with an average number of grain boundaries in the active channel region that is one or more less than the average number of grain boundaries in the active channel region of a thin film transistor at the pixel portion. It is Applicants' interpretation that this publication does not address differing numbers of grain boundaries in the thin film transistors.

Conclusion

Applicant submits that his present invention is patentable over the above references for at least the reasons discussed herein. Accordingly it is respectfully submitted that this petition be allowed and the present application be designated for accelerated examination. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 23-1951.

Respectfully submitted,

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